

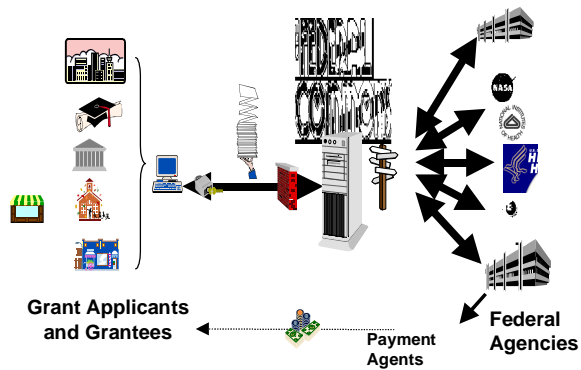
Federal Pilot Architecture Project Analysis and Lessons Learned

September 28, 2001

Paula Hagan, D.Sc.

Ann Reedy, Ph.D.

P. Kathie Sowell



The MITRE Corporation

MITRE

Software Engineering Center
McLean, Virginia

Sponsored by the
Federal CIO Council

Executive Summary and Recommendations

The primary purpose of the Federal Pilot Architecture Project was to test the use of eight of the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Architecture Framework products to document architectures developed in accordance with the Federal Enterprise Architecture Framework (FEAF). The project piloted the products by developing initial versions of them for the proposed grants and international trade segments within the Federal Enterprise Architecture. These products will lay groundwork for possible establishment of these segments, a secondary project objective. The C4ISR Architecture Framework will soon be updated and renamed the DoD Architecture Framework Version 1.0. The remainder of this document refers to the DoD Framework and products.

Use of DoD Products with the FEAF

The DoD product descriptions specify the intent and content for each product. The product descriptions are not intended to restrict the methodology or tools used to develop the product. The architect tailors the level of detail needed for the purpose of the architecture. The FEAF provides only brief descriptions of the information required for each cell of the FEAF. More specific direction is required to document federal segments and architectures to ensure the needed information is documented, the architecture products integrate well, and information is comparable across segments or architectures. The DoD Architecture Framework products offer information content direction and are an integrated set of products so they may prove useful with the FEAF.

The DoD Architecture Framework identifies certain architecture products as *mandatory* for all architectures. The products used in the pilot are these mandatory products, including the Activity Model (which was not mandatory in earlier C4ISR versions, but is being made mandatory in the new updated version which will be published as DoD Architecture Framework Version 1.0).

Figure E-1 shows six of the eight products piloted, their value added, and their relationships. The other two products piloted were the Integrated Dictionary and Overview and Summary Information. These two products relate to all products piloted.

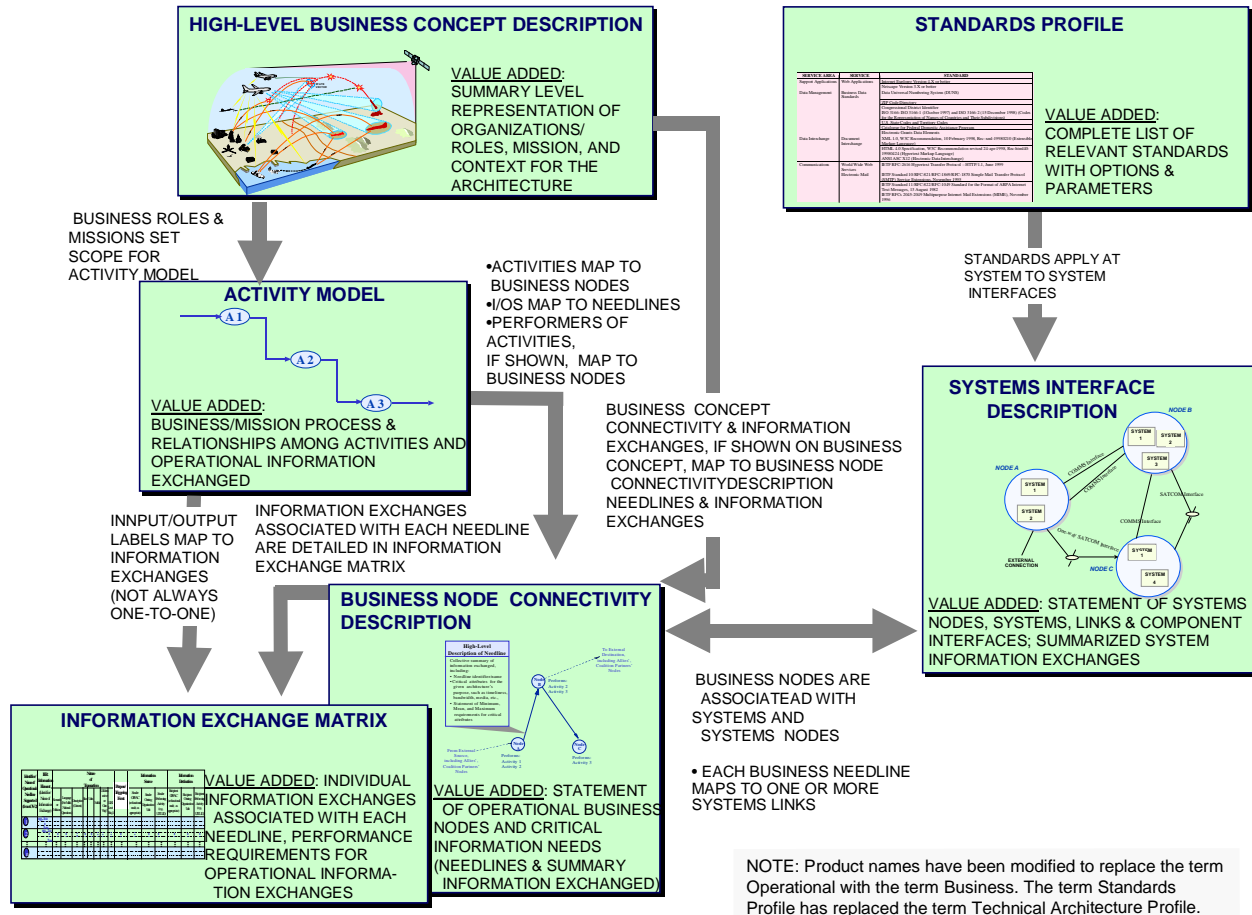


Figure E-1. Relationships and Value-Added for Architecture Products

The Federal Enterprise Architecture Framework Level IV identifies the kinds of models that describe the business architecture and the data, applications, and technology design architectures. Figure E-2 shows how the DoD products map to the FEAF cells. The Activity Hierarchy Chart within the Activity Model provides and organizes the list of activities for the Planner's View Applications Architecture. The Activity Model provides the full business process model for the Owner's View Applications Architecture.

The major nodes in the Operational Node Connectivity Description (ONCD) provide the list of locations at which the enterprise operates at a fairly high level of aggregation for the Planner's View Technology Architecture. The complete ONCD provides the business logistics model including business locations and their connections needed for the Owner's View Technology Architecture.

Entries in the Integrated Dictionary contribute to the list of business objects in which the enterprise is interested for the Planner's View Data Architecture. The Information Exchange Matrix contributes to the development of the semantic model but may not contain all information needed for an entity/relationship model in the Owner's View Data Architecture. The DoD Logical Data Model, not a mandatory DoD product so not examined in this pilot, contains the

information items and/or data elements, their attributes, their interrelationships, and other detail required to complete the Owner's View Data Architecture semantic model. The detail in the DoD Logical Data Model can also cover information required for the FEAF Designer's View Data Architecture Logical Data Model.

The System Interface Description (SID) and Technical Architecture Profile contribute to the System Geographic Deployment Architecture required for the Designer's and Builder's Views Technology Architecture.

Perspectives	Data Architecture (entities = what)	Applications Architecture (activities = how)	Technology Architecture (locations = where)
Planner's View Objectives/Scope	List of Business Objects <i>Integrated Dictionary</i>	List of Business Processes <i>Activity Hierarchy Chart in Activity Model</i>	List of Business Locations <i>Op'n'l Node Connectivity Desc.</i> • Major nodes only • Needlines not annotated
Owner's View Enterprise Model	Semantic Model <i>Information Exchange Matrix also contributes</i> <i>Logical Data Model</i>	Business Process Model <i>Activity Model (Full model)</i>	Business Logistics System <i>Op'n'l Node Connectivity Desc.</i> • All nodes • Needlines annotated <i>Information Exchange Matrix</i>
Designer's View Information Systems Model	Logical Data Model	Application Architecture	System Geographic Deployment Architecture <i>System Interface Description</i> <i>Technical Architecture Profile</i>
Builder's View Technology Model	Physical Data Model	System Design	Technology Architecture <i>System Interface Description</i> <i>Technical Architecture Profile</i>
Subcontractor's View Detailed Specifications	Data Definition "Library or Encyclopedia" <i>Integrated Dictionary (Detailed examination)</i>	Programs ("Supporting Software Components (i.e., Operating Systems)")	Network Architecture

Note: The Logical Data Model is not mandatory

Figure E-2. Mandatory DoD Architecture Products Related to the FEAF

Findings on the Products

The DoD product descriptions provided the types of information required by the FEAF as described above. Some products need minor tailoring to adapt them for use with the FEAF such as changing terminology from operational to business, removing military examples, and ensuring the user is directed to include the controlling software to the Designer's Technology Architecture System Interface Description product. No major issues resulted from the mandatory product descriptions having originated in the DoD environment. An adaptation of the DoD Logical Data Model, not piloted, is needed for use with the FEAF Data Architecture Owner's and Designer's Views.

Federal Grants Pilot Architecture

The Federal Grants Pilot Architecture focused on the Federal Commons and its users. The Federal Commons is a system within the proposed grants segment. Because the scope was limited to the Federal Commons and did not explore the grants management processes used within federal agencies, the eight products make only a small contribution to the groundwork needed to establish a grants segment. However, the project was a good choice for a first project in that it allowed many architecture product issues to be addressed in a relatively simple example. The resultant documents provide readable, non-voluminous examples to illustrate the architecture documentation products.

Federal International Trade Pilot

The Federal International Trade Pilot Architecture provides a broad overview of federal international trade responsibilities and provides initial versions of seven of the DoD products. The documents describe high-level business processes and identify common information used by several agencies. They also provide examples of documentation of a complex architecture. They lay needed groundwork to develop the international trade segment. Later sections of this document recommend specific information areas that could be targeted to explore interoperability improvements and identify common business processes with potential for sharing methods and tools.

Recommendations

Primary Recommendations

1. Incorporate into the FEAF the eight DoD products listed below with some wording and example tailorings to make them blend better into the FEAF.

- Overview and Summary Information
- Integrated Dictionary
- High-Level Operational Concept Description
- Operational Node Connectivity Description (ONCD)
- Operational Information Exchange Matrix (IEM)
- Activity Model

- System Interface Description
- Technical Architecture Profile

2. Standard data definitions are needed to increase interoperability and design the data architecture. More guidance is needed than that provided in the FEAF. **Tailor and/or pilot product description(s) for the Owner's and Designer's Views Data Architecture from the DoD Logical Data Model** and related products as preparation for their incorporation into the FEAF.

3. **Examine additional DoD products** for their integration into the FEAF.

4. **Continue to develop the proposed international trade segment.** Begin with the following information areas **to improve information sharing** and easy access:

- **Import and export license information**
- Arrival/departure information
- Inspection needs
- U.S. import and export trade statistics – common easy to use interface only
- Foreign tariffs, trade statistics, and business regulations

Entry documentation, entry summary, and Shipper's Export Declaration (SED) information processing are being improved by Customs and Census and are therefore not included in this list. The Customs Modernization effort, building on Integrated Trade Data System (ITDS) ideas, may also address portions of the first three topics listed, but they are specifically cited here to ensure all cross-agency needs are considered. For information areas such as licenses and inspection needs, **develop a cross-agency common set of data elements, definitions, and representations where they do not exist.**

The following areas need **further investigation** to determine information sharing or common process possibilities.

- **Enforcement**
- Analysis of trade and tariff information
- Policy development
- Trade agreement negotiation
- Trade leads and contacts

The nature of the information produced (e.g., analysis reports, policy drafts) and style of information sharing (e.g., reports, e-mails) associated with policy development and trade agreement negotiation may require a more textual and interactive rather than traditional table-oriented or computational data processing approach.

5. Continue to develop the proposed grants segment by **developing the eight products for the grants management processes used by federal agencies** as follows. Examine the business

processes within federal agencies and the associated data and its flow. This examination should cover federal agencies and grantees with different quantities of grants to manage, different types of grants, and different sophistication in their grant processes. For example, the NIH has a very sophisticated grant community and makes large grants. The Department of Education may make smaller grants, but makes thousands of them. Still other federal agencies may not have advanced automated systems to deal with managing grants. Likewise, the sophistication of the applicant's/grantee's tools should be considered. The needs of all of these situations should be examined as well as cross-agency grant-related communications. The analysis should look for common processes which might allow common automation tools and improve the consistency of the interface with the public while preserving the decision-making authority and control of the agency.

Secondary Recommendations

6. Develop and provide general advice on architecture viewpoint, purpose, and scope issues.
7. Explore better electronic, web-oriented presentation styles for large models.
8. Develop some general guidelines on how to determine how deep to go in the Activity Model and what detail to include at what level for federal segments.

Table of Contents

Section	Page
Executive Summary and Recommendations	iii
1 Introduction	1
2 Relating the Products to the FEAF	3
2.1 Overview of the DoD Mandatory Products	3
2.2 The FEAF Cells	5
2.3 Relating the DoD Products to the FEAF	6
2.4 The Products Related to OMB Circular A-130	13
3 Lessons Learned Building the Products	15
3.1 Order of Building the Products	15
3.2 Activity Model	15
3.3 Integrated Dictionary	17
3.4 Operational Node Connectivity Description	18
3.5 Operational Information Exchange Matrix	19
3.6 System Interface Description	20
3.7 High-Level Operational Concept Description	20
3.8 Technical Architecture Profile	20
3.9 Overview and Summary	21
3.10 Resources Used to Build the Pilot Architectures	21
4 Comments and Observations on the Federal International Trade Pilot Architecture	23
4.1 Participants	23
4.2 Common Data Areas	23
4.3 Common Processes	29
4.4 Modeling Issues	30
4.5 To-Be Model	31
4.6 Summary	31
5 Comments and Observations on the Federal Grants Pilot Architecture	33
6 Commonality between Grants and International Trade	35
References	37

Section 1

Introduction

The primary purpose of the Federal Pilot Architecture Project was to determine whether eight Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR)¹ architecture products (1), could be used to document architectures developed in accordance with the Federal Enterprise Architecture Framework (FEAF) (2). The FEAF provides only brief descriptions of the information required for each cell of the framework. More specific direction is required to document federal segments and architectures to ensure all the needed information is documented, the architecture products integrate well, and that information is comparable across segments or architectures. The DoD Architecture Framework products specify the intent and content for each product and are an integrated set of products. The product descriptions do not restrict the methodology or tools used to develop the product. The architect tailors the level of detail needed for the purpose of the architecture. The DoD products may prove useful with the FEAF.

A secondary purpose of the pilot was to lay groundwork to establish the proposed grants and international trade segments within the Federal Enterprise Architecture. This document presents the analysis findings and lessons learned from the project. The grants and international trade pilot architectures are contained in separate documents (3,4).

The DoD Architecture Framework Version 1.0 (formerly the C4ISR Architecture Framework) prescribes mandatory and supporting architecture products and specifies the information required in the products, but not the development methodology or tools used for the products. This document contains a brief overview of the mandatory products, but refers the reader to the source documents for complete information. This document assumes the reader is familiar with the FEAF, the DoD Architecture Framework products, OMB Circular A-130 (5), the Federal Grants Pilot Architecture, and the Federal International Trade Pilot Architecture.

Section 2 presents a brief description of each of the eight mandatory products, relates them to the FEAF, and relates them to documentation required by OMB Circular A-130. Section 3 contains lessons learned on developing each of the DoD products. The products are presented in the order in which they might be developed, NOT the order a reader would read them. This allows the reader to see how the products build on each other. Section 4 presents observations on the Federal International Trade Pilot Architecture. Section 5 presents observations on the Federal Grants Pilot Architecture. Section 6 discusses commonality between the grants and international trade proposed segments. Recommendations are identified in Sections 3, 4, and 5 of the text and are contained in the Executive Summary.

¹ The C4ISR Architecture Framework is being updated and renamed the DoD Architecture Framework Version 1.0. The products are referred to as the DoD rather than the C4ISR products in the rest of this document.

Section 2

Relating the Products to the FEAF

2.1 Overview of the Mandatory Products

The mandatory DoD products² are:

1. Overview and Summary Information

This product contains summary textual information concerning “who, what, when, why, and how.” It includes the architecture identification, purpose, scope, context, findings, tools and file formats, level of effort, and lessons learned.

2. Integrated Dictionary

The integrated dictionary provides a central source for all definitions and metadata.

3. High-Level Operational Concept Description

The High-Level Operational Concept Description (OpsConcept) is the most general of the architecture-description products and the most flexible in format. Its main utility is as a facilitator of human communication and it is intended for presentation to high level decision makers. It should convey, in simple terms, what the architecture description is about and give an idea of the players and actions involved. It can be used to orient and focus detailed discussions. The description is often cartoon-like in appearance.

4. Operational Node Connectivity Description (ONCD)

This product features the operational (business) nodes and elements, and the needlines between them. The needlines indicate the need for information exchange between two nodes, not the route that the information will take in its actual transfer.

5. Operational Information Exchange Matrix (IEM)

The Information Exchange Matrix expresses the relationship across activities, operational nodes and their elements, and information flow, with a focus on the specific aspects of the information flow. It captures who exchanges what information with whom, why the information is necessary, and what degree of information exchange sophistication is required. It describes the relevant attributes of the exchange (e.g., substantive content, media, volume requirements, security, timeliness, and requirements for information interoperability) and keys the exchange to producing and using activities and nodes and to the needline the exchange satisfies.

² The DoD Architecture Framework features operational, technical, and system architecture views at the highest level. The operational view is similar to the business architecture in non DoD parlance. The technical view includes the standards. The systems view describes the hardware and software used to implement the operational view. See Reference 1 for a complete explanation of this approach. The term business is substituted for operational in some places in this document to improve readability.

6. Activity Model³

The Activity Model describes the applicable (business) activities associated with the architecture, the information exchanged between activities, and the information exchanged with other activities that are outside the scope of the model (i.e., external exchanges). The models are hierarchical in nature; they begin with a single box that represents the overall activity and proceed successively to decompose the activity to the level required by the purpose of the architecture.

7. System Interface Description (SID)

The System Interface Description depicts the assignment of systems and their interfaces to the nodes and needlines described in the ONCD. The ONCD shows operational, or business nodes, while the SID depicts the corresponding system nodes and the systems resident at those nodes. It links the operational, or business view and the systems view.

8. Technical Architecture Profile

This product references the technical standards that apply to the architecture and how they need to be, or have been, implemented.

Figure 1 shows the relationships among several of the products and their value-added.

³ The Activity Model was not required in past versions of the C4ISR Architecture Framework, but will be required in future versions to be published as the DoD Architecture Framework Version 1.0. It is critical to building an enterprise architecture and satisfying OMB A-130.

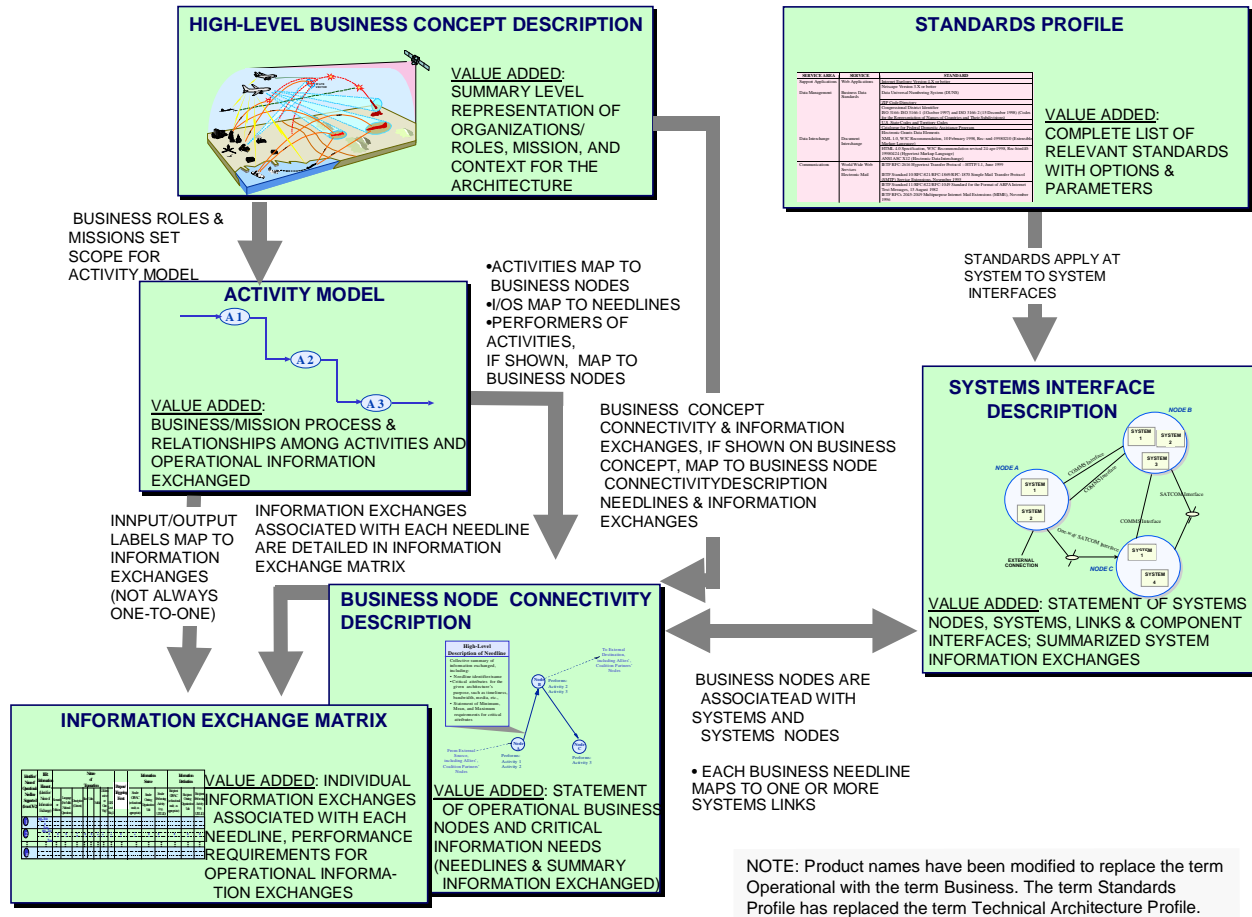


Figure 1. Relationships Among and Value-Added For Architecture Products

2.2 The FEAF Cells

The Federal Enterprise Architecture Framework Level IV identifies the kinds of models that describe the business architecture and the data, applications, and technology design architectures. Figure 2 shows the FEAF Level IV.

Perspectives	Data Architecture (entities = what)	Applications Architecture (activities = how)	Technology Architecture (locations = where)
Planner's View Objectives/Scope	List of Business Objects	List of Business Processes	List of Business Locations
Owner's View Enterprise Model	Semantic Model	Business Process Model	Business Logistics System
Designer's View Information Systems Model	Logical Data Model	Application Architecture	System Geographic Deployment Architecture
Builder's View Technology Model	Physical Data Model	System Design	Technology Architecture
Subcontractor's View Detailed Specifications	Data Definition "Library or Encyclopedia"	Programs ("Supporting Software Components (i.e., Operating Systems)")	Network Architecture

Figure 2. Federal Enterprise Architecture Framework, Level IV

The FEF provides a general description of the content of each cell of the framework on pages 28-30 of the FEF.

2.3 Relating the DoD Products to the FEF

The Activity Hierarchy Chart within the Activity Model provides and organizes the list of activities for the Planner's View Applications Architecture. The Activity Model provides the full business process model for the Owner's View Applications Architecture.

The major nodes in the Operational Node Connectivity Description provide the list of locations at which the enterprise operates at a fairly high level of aggregation for the Planner's View Technology Architecture. The complete ONCD provides the business logistics model including business locations and their connections needed for the Owner's View Technology Architecture.

Entries in the Integrated Dictionary contribute to the list of business objects in which the enterprise is interested for the Planner's View Data Architecture. In Figure 3, the Integrated dictionary is also shown contributing to the Subcontractor's View Data Architecture. The Integrated Dictionary, as the repository of all definitions and metadata for the architecture, contributes throughout the architecture models.

The Information Exchange Matrix contributes to the development of the semantic model but may not contain all information needed for an entity/relationship model in the Owner's View Data Architecture. The DoD Logical Data Model, not a mandatory DoD product so not examined in this pilot, contains the information items and/or data elements, their attributes, their interrelationships, and the other detail required to complete the FEAF Owner's View Data Architecture semantic model. The detail in the DoD Logical Data Model can also cover information required for the FEAF Designer's View Data Architecture Logical Data Model.

The System Interface Description (SID) and Technical Architecture Profile contribute to the System Geographic Deployment Architecture required for the Designer's and Builder's Views Technology Architecture.

Figure 3 shows these relationships. The DoD products are shown in italics. The Logical Data Model is not mandatory.

Perspectives	Data Architecture (entities = what)	Applications Architecture (activities = how)	Technology Architecture (locations = where)
Planner's View Objectives/Scope	List of Business Objects <i>Integrated Dictionary</i>	List of Business Processes <i>Activity Hierarchy Chart in Activity Model</i>	List of Business Locations <i>Op'n'l Node Connectivity Desc.</i> • Major nodes only • Needlines not annotated
Owner's View Enterprise Model	Semantic Model <i>Information Exchange Matrix also contributes</i> <i>Logical Data Model</i>	Business Process Model <i>Activity Model (Full model)</i>	Business Logistics System <i>Op'n'l Node Connectivity Desc.</i> • All nodes • Needlines annotated <i>Information Exchange Matrix</i>
Designer's View Information Systems Model	Logical Data Model	Application Architecture	System Geographic Deployment Architecture <i>System Interface Description</i> <i>Technical Architecture Profile</i>
Builder's View Technology Model	Physical Data Model	System Design	Technology Architecture <i>System Interface Description</i> <i>Technical Architecture Profile</i>
Subcontractor's View Detailed Specifications	Data Definition "Library or Encyclopedia" <i>Integrated Dictionary (Detailed examination)</i>	Programs ("Supporting Software Components (i.e., Operating Systems)")	Network Architecture

Figure 3. Mandatory DoD Architecture Products Related to the FEAF

Table 1 provides a comparison of the information needed for selected FEAF cells and the information provided by the related mandatory DoD products.

Table 1. Comparison of Information Needed for Selected FEAF Cells and Information Contained in Mandatory DoD Products

FEAF Perspective		Required Information	DoD Product and Information
Planner	Data Architecture	List of Business Objects, eventually contributing to data model	<i>Integrated Dictionary</i> – Inputs, outputs, and mechanisms related to Business Model <i>Information Exchange Matrix</i> – List of information exchanged between nodes
	Applications Architecture	List of Business Processes	<i>Activity Hierarchy Chart</i> in Activity Model – Organized list of Business Processes
	Technology Architecture	List of Business Locations	<i>Operational (Business) Node Connectivity Description</i> with only major nodes; needlines not annotated – Diagram incorporating list of business locations with initial indication of connection between locations
Owner	Data Architecture	Semantic Model – typically represented as an entity/relationship model at level of definition expressing concepts used in significant business strategies later implemented as business rules	<i>Integrated Dictionary</i> – Description of information important to model <i>Information Exchange Matrix</i> - sizing, media exchange forms, interoperability, and security characteristics of information exchanges <i>Logical Data Model</i> (Not piloted) – Data requirements and structural business process rules of operational (business) view. The full detailed logical data model includes the data elements, their attributes, and their interrelationships. A higher level, less formal model, such as an entity-relation model without entity attributes will suffice for some purposes (such as satisfying the Owner's View before developing the fully detailed model in the Designer's View)

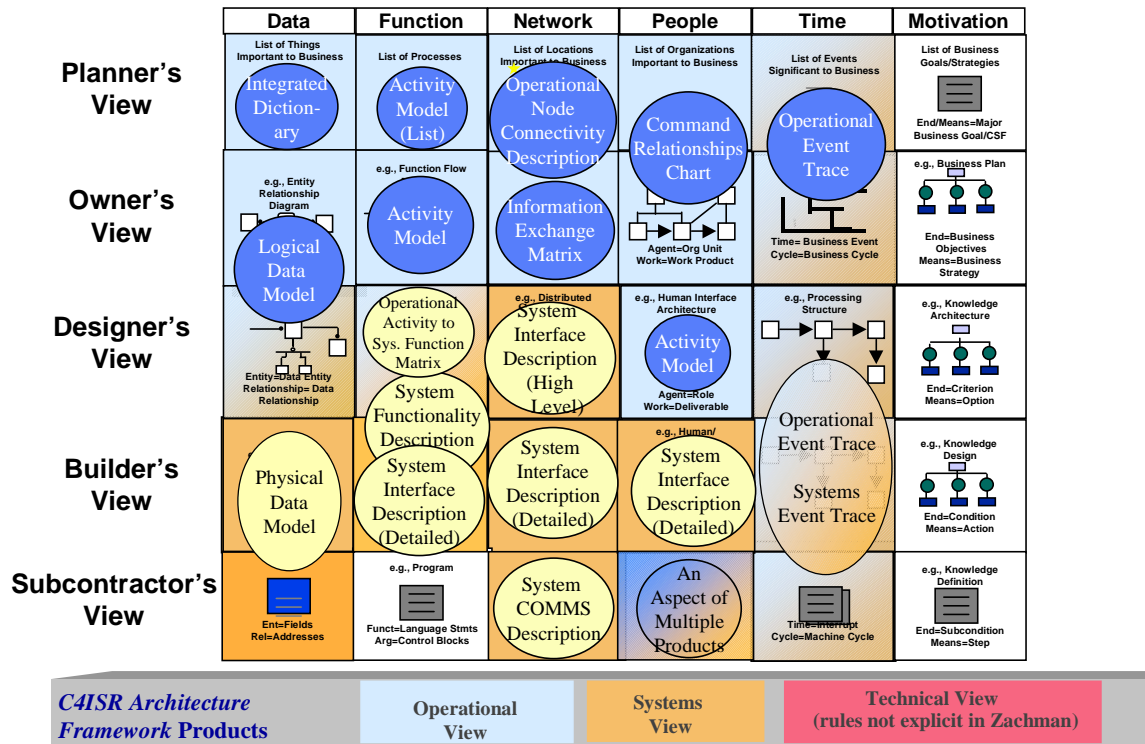
FEAF Perspective		Required Information	DoD Product and Information
	Application Architecture	Business Process Model – independent of any system or implementation considerations and organizational constraints. Can be expressed as a structured methods-style model expressing business transformation (processes) and their inputs and outputs	<i>Activity Model</i> – Portrays business activities, or processes, their inputs, outputs, mechanisms, and controls
	Technology Architecture	Business Logistics System – model of the locations of the enterprise and their connections (i.e., voice, data, post, rail, ship, etc.)	<p><i>Operational (Business) Node Connectivity Description</i> – Model of the operational (business) nodes, the needlines indicating the need to transfer some kind of information between two nodes, and the characteristics (content, media (voice, fax, electronic, rail, etc.), volume, security, etc.) of the information exchanged. The needlines between two nodes represent the sum of all the exchanges between the nodes.</p> <p><i>Information Exchange Matrix</i> – Contains the characteristics of each information exchange</p>

FEAF Perspective		Required Information	DoD Product and Information
Designer	Technology Architecture	System Geographic Deployment Architecture – Logical model of the system implementation of the business logistics system depicting the types of systems facilities and controlling software at the nodes and lines	<p><i>System Interface Description</i> – Assignment of systems and their interfaces to the nodes and needlines described in the Operational Node Connectivity Description (parallel to Business logistics model as described above). The graphic depictions and/or supporting text for the System Interface Description can also provide details concerning the capabilities present in each system. For example, descriptions of information systems should include details concerning the procedures governing system implementation, the applications present within the system, the infrastructure capabilities and services that support the applications, and the means by which the systems processes, manipulates, stores, and exchanges data.</p> <p><i>Technical Architecture Profile</i> – References the technical standards that apply to the architecture and how they need to be, or have been, implemented.</p>
Builder	Technology Architecture	Technology Architecture – Physical depiction of the technology environment for the enterprise showing the actual hardware and systems software at the nodes and the lines and their systems software, including operation systems and middleware	<p><i>System Interface Description</i> – Assignment of systems and their interfaces to the nodes and needlines described in the Operational Node Connectivity Description (parallel to Business logistics model as described above). The graphic depictions and/or supporting text for the System Interface Description can also provide details concerning the capabilities present in each system. For example, descriptions of information systems should include details concerning the procedures governing system implementation, the applications present within the system, the infrastructure capabilities and services that support the applications, and the means by which the systems processes, manipulates, stores, and exchanges data.</p> <p><i>Technical Architecture Profile</i> –</p>

FEAF Perspective		Required Information	DoD Product and Information
			References the technical standards that apply to the architecture and how they need to be, or have been, implemented.
Subcontract-or	Data Architecture	Data Definition “Library or Encyclopedia” – The definition of all the data objects specified by the physical data model and would include all the data definition language required for implementation	<i>Integrated Dictionary</i> – Contributes to definition of data objects

The mandatory DoD products provide the information needed for all three columns of the Planner’s View and for the Applications Architecture and Technology Architecture Owner’s View. The Information Exchange Matrix contributes to the Semantic Model required for the Owner’s View Data Architecture. The DoD Logical Data Model provides the complete entity/relationship model needed for the Data Architecture Owner’s View. The System Interface Description and Technical Architecture Profile contribute to the Technology Architecture.

While this pilot explored only the mandatory products, many other DoD products contribute to architecture description. Figure 4 shows some of the DoD products mapped to the Zachman Framework. The FEAF Framework was based on the Zachman Framework and the Zachman Function and Network columns correspond to the FEAF Applications and Technology columns, respectively. The Figure 4 mapping will help the reader locate some of the documents he or she may want to produce for developing other cells in the architecture.



* Only selected DoD products are shown on this figure.

Figure 4. Some DoD Products Mapped to the Zachman Framework Cells, and thus to the FEAF Cells

Recommendations 1, 2, and 3⁴: The eight mandatory DoD architecture product descriptions offer a well-researched set of products which can help the FEAF user develop an Enterprise Architecture by providing guidance on and examples of products containing the information needed. The relationships between the products are also explained. Some product descriptions contain DoD examples and DoD terminology, but no significant content issues were found in using the products in a non DoD domain. Some DoD products contained more detail than required by the very brief FEAF cell descriptions. The detail was generally useful in developing the next lower level view in the FEAF. Tailoring flexibility would allow the architect to adapt the products to the level of detail required for the purpose of the architecture.

1. MITRE recommends the eight DoD mandatory products, including the Activity Model, be tailored with non DoD terminology and examples, then added to the FEAF.

⁴ The recommendation numbers correspond to the numbers in the Executive Summary and Recommendations Section and are not sequential throughout the text of the following sections.

2. **MITRE recommends tailoring and/or piloting** product description(s) for the Owner's and Designer's Views Data Architecture from the **DoD Logical Data Model** and related products as preparation for their incorporation into the FEAF.
3. MITRE recommends **other DoD products be examined to consider their adaptation for and addition into the FEAF.**

2.4 The Products Related to OMB Circular A-130

OMB Circular A-130 requires federal agencies to develop an enterprise architecture, document certain features about those architectures, develop capital planning and investment management processes, and address security issues. Many of the requirements directed by OMB Circular A-130 are met by the DoD architecture products. Figure 5 shows the relationship between some of the DoD products and OMB A-130 requirements.

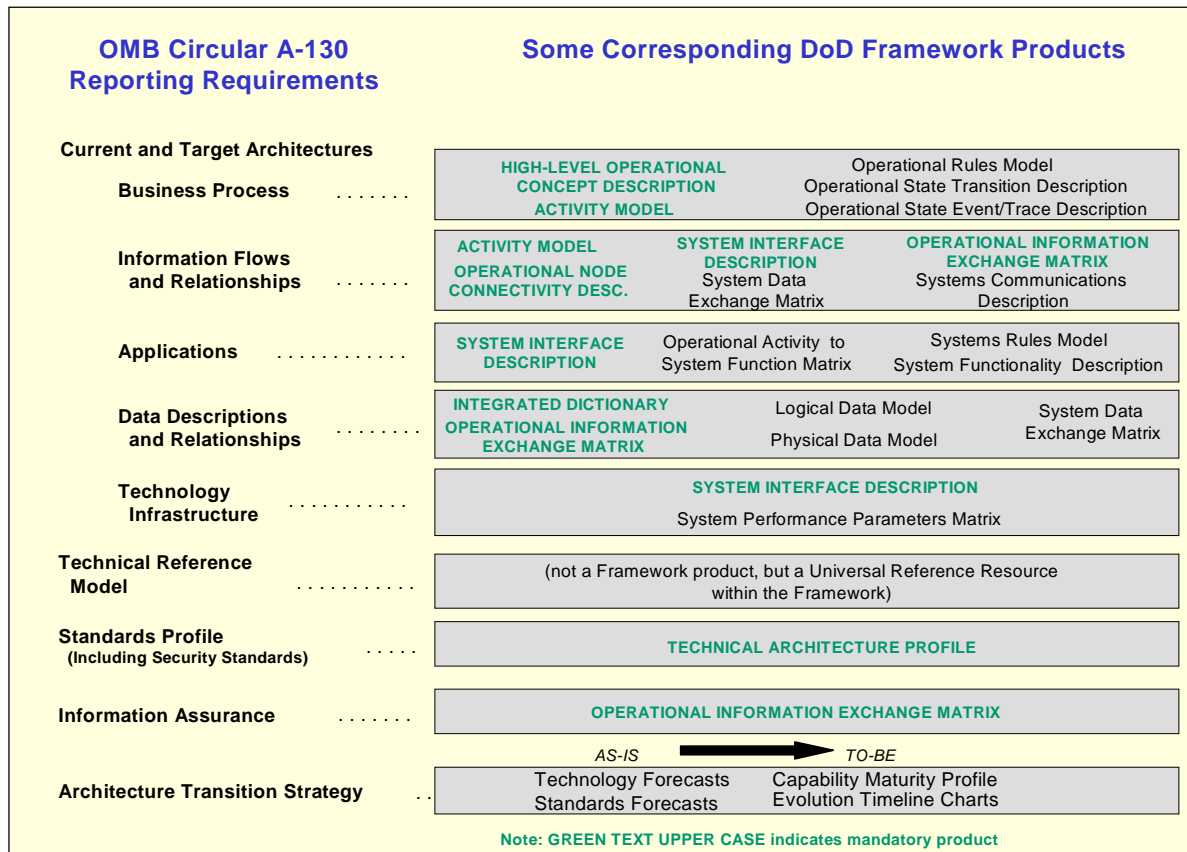


Figure 5. Some DoD Framework Products Corresponding to OMB Circular A-130 Reporting Requirements

Section 3

Lessons Learned Building the Mandatory Products

3.1 Order of Building Products

The process of building an architecture begins with establishing the purpose and scope of the architecture and, subsequently, the activity model. The architecture purpose and scope are in the Overview and Summary Information product. The purpose and scope of the activity model are aligned with the purpose and scope of the architecture as a whole. The purposes of building an architecture may include to:

- provide a basis for investment planning,
- improve business processes,
- determine and improve the interoperability needs of the enterprise,
- identify and eliminate redundancy in business processes and IT capabilities,
- lay groundwork for transition planning and system design, and/or
- select hardware and software consistent with the business needs.

For the pilot, the primary purpose was to test the use of DoD architecture products with the FEAF and secondarily to lay groundwork for proposed FEAF segments.

The following discussion addresses the products in the approximate order they were built for the pilots. Other orders are possible. Building the products is an iterative process where, for example, one might focus on building the Activity Model, then the ONCD, then the Activity Model again, simultaneously maintaining the Integrated Dictionary, all through several iterations.

3.2 Activity Model

The scope affects the activities considered. For grants, the Federal Commons and its users were chosen as the scope (See explanation in Section 5). This scope excluded detailed investigation of the activities of an agency in processing grants, and so limits the use of the architecture for gaining insight into grants as a segment within the Federal Enterprise Architecture. Initially, the international trade pilot was considering simply expanding on Customs Modernization architecture work because of a restricted budget. This restriction would have prevented the development of the broad and more balanced picture of international trade that resulted. The broader picture will be more useful for segment groundwork. Due to the extensive scope of international trade, it may be necessary to work on slices within the segment to achieve manageable project size and coordination in the future.

The viewpoint for the grants pilot was that of the users of the Federal Commons. This allowed more business rather than just system context and tried to bring in the business processes associated with the Federal Commons. The international trade viewpoint was that of the federal agencies involved in international trade. This treated the import/export trade served by the government as suppliers and receivers of information. It allowed the pilot to focus on processes over which the federal government has control and emphasized the government responsibility.

Control over the business processes would allow the government to better define the detail for the segment and improve its business processes where appropriate.

Recommendation 6: Develop and provide general advice on viewpoint, purpose, and scope issues. Such advice on how to determine these might be helpful guidance on developing enterprise architectures in the near term. As agencies become more experienced, this guidance may become more common knowledge.

The activity model brings out business processes, relationships, and information flow. It targets the business interoperability needs of the enterprise or segment. Integration Definition 0 (IDEF0) diagrams were used in the pilot because they are a proven technique for modeling business processes. The IDEF0 standard (6) states that IDEF0 function modeling is designed to represent the decisions, actions, and activities of an existing or prospective organization or system. They capture business processes and information flow. Use of IDEF0 is NOT required by the DoD Framework product descriptions. Some experimentation with Rational Rose sequence diagrams to capture information flows was done, but was limited by the resources available.

There is not necessarily a one-to-one correspondence between the information flows shown as inputs or outputs in the Activity Model and the information exchanges in the IEM. The IEM exchanges are a function of which nodes are defined in the ONCD. An information exchange shows only if the information crosses a needline in the ONCD. If information stays within a process in the Activity Model, but is transferred between two or more nodes in the ONCD, it will have an associated needline in the ONCD and will show in the IEM. A later decomposition of the process containing the exchange may show the information exchange flowing from one detailed activity to another in the more decomposed Activity Model. If information flows between two activities in the Activity Model, but the activities are conducted at the same node, the information does not cross a needline in the ONCD and will not show up in the IEM. This characteristic may help determine the level of depth an architect wants to go to in developing its activity model or defining nodes. It also implies the architect must be constantly cross checking all of the models for consistency. Some automated tools may not have the sophistication to handle this characteristic.

Because IDEF0 does not explicitly handle model sequences, it was difficult to portray the iterative, overlapping, or all pervasive nature of some of the activities or organizational involvement for international trade. For example, trade policy development is a highly iterative and collaborative process engaging many people. Yet a diagram of the detailed process, just from positioning on the page, is easily misinterpreted as a sequential process. The Export Assistance Centers (EACs) provide ongoing support to an exporter; they may help him or her with trade promotion, finding foreign market information, or many other aspects of international trade. This ongoing and possibly intermittent relationship does not come across clearly in the model. An architecture product not examined in this pilot that does explicitly show sequencing is the Event Trace Diagram.

The FEAF calls for the Business Process Model to be independent of any organizational constraints. The international trade model nodes in the ONCD are inherently organizations.

Many of these organizational charters are established literally by an act of Congress and long standing U.S. Laws. The international trade models do not have the same degree of organizational flexibility that the Commissioner of an agency with 100,000 employees has, however difficult that agency may be to change. However, the Activity Model was not designed around the organizations, but around the activities; the organizations show only as mechanisms.

The facing page text in an Activity Model is normally one page, but is not limited to one page in the IDEF0 standard. In the grants model, there were some problems which, to keep the text to one page, were dealt with by shrinking the text font. In a few cases where a second page was necessary, a blank page was inserted to maintain the left side convention for the facing page text so the reader would be able to lift pages and see the text and the diagram at the same time. For the international trade model, the facing page text became voluminous, yet reducing the explanations did not serve the reader well. This may be due in part to the expansiveness of the model and the limited depth of the Activity Model. Had the model gone to more detailed breakouts of the activities, the text at higher levels could have been condensed. Also note that the desire for one page of text is very paper oriented. If the document is viewed electronically with a smaller monitor, the reader does not normally look at two screens, i.e., the facing page text and the diagram, simultaneously.

Recommendation 7: Explore better electronic, web-oriented presentation styles for large models.

The modeling process is iterative. Detail will be included at first that is later excluded. The organization of activities will change several times. The best place to put an activity in the hierarchy is not always obvious. Which areas of the architecture to develop more fully may depend on the architecture's purpose or near term capital expenditures being made. One general piece of advice is to develop the model to one level deeper than the finished model, so you know the level above is correct.

Recommendation 8: Develop some general guidelines on how to determine how deep to go in the Activity Model and what detail to include at what level.

3.3 Integrated Dictionary

Develop the dictionary as you go. As you research Inputs, Outputs, Controls, and Mechanisms (ICOMs) and other information about the model, enter the information into the dictionary. Use the dictionary to record partial information until you can complete it. In the trade model, the dictionary was tailored to include and specially flag organizations which are not ICOMS in the model at its current level of detail, but which may appear in a more detailed model. The DoD product descriptions specify which fields to record for each type of entry.

During the very early stages, the grants dictionary was organized by activity, but was quickly alphabetized. The organization by class of item, i.e., activity, ICOM, model information, etc., is traditional. Many of the dictionary entries are metadata rather than architecture description data. The organization by type of data helps separate the metadata from the data.

3.4 Operational Node Connectivity Description

The ONCD relates mechanisms that perform activities in the activity model to the business nodes that perform those activities. It also identifies the need for information exchange between those business nodes. The relationship between mechanisms representing business nodes in the activity model and business nodes in the ONCD is not always one-to one; often the activity model may be at a higher level of aggregation. If the ONCD explicitly lists the activities performed at each node, the mapping to the activity model is more visible.

In the grants pilot, the issues of representation of external nodes surfaced. In earlier versions, the external nodes were shown as ovals just like the internal nodes. This allowed the reader to see clearly where information was going. There was a problem transferring this representation to an automated tool, so it was decided to indicate the external node, but not show it explicitly. In the trade model, the external nodes are shown as ovals like internal nodes, but colored differently. Showing the external nodes adds to the readability of the diagram.

The DoD Architecture Framework contains a discussion on what can be a node. In a business model, nodes include roles, organizations, operational facilities, and other things, but normally are not systems. Systems are viewed as supports to the business architecture and not normally shown in higher level business architecture diagrams. (Some IT professionals tend to put them there because that is their orientation.) The grants model became problematic in that the Federal Commons is essentially a system. By treating it as the facility including the Federal Commons system, an effort was made to avoid defining a business node as a system.

As industry moves to business processes which feature a common point of contact or communication through a computer system that routes the information to the appropriate party, the system performing that function becomes an integral part of the business process. It is serving the routing function that used to be performed by other widely distributed human beings. This same property of being a central point of contact for the public and providing routing services directing information to the appropriate federal agency is seen in one possible to-be vision of the international trade model. Instead of the importer or broker applying for an import license by contacting a federal agency directly, the importer submits the application to a common front end system which routes it to the appropriate federal agency. The computer system node is becoming an integral part of the business process and in this case may need to be shown in the ONCD. This particular case creates an ambiguity in the separation of needline from communication route.

The needlines in the grants pilot ONCD are both numbered and named. The numbers allow one to trace the needline to the IEM. The names give a sense of the purpose of the needline. There is one line for each direction in which information travels. This was done to explore whether two-way or one-way lines worked better in the model. The grants ONCD is simple and the naming, numbering, and two arrows between nodes posed no particular problems.

The international trade ONCDs are very dense. Several strategies were used to reduce the complexity. Using two separate directed arrows rather than double headed arrows for two-directional information exchange between nodes would have increased the line density making

the diagram more difficult to read. Space in the diagrams to put meaningful names on every needline was not available. In one version of the diagrams, every line was labeled with the types of information transmitted over it, but this made the diagram cluttered and the unfamiliar reader was not always sure which line to associate with the text. Numbering the needlines, especially in the early stages of the model, would have presented a maintenance problem for an analyst using Office tools. As the work progressed, a naming scheme was created in the IEM that captured the name of the connected nodes and the directionality of the information exchange. Automated tools may alleviate some of these problems. The final ONCD presentation uses numbered needlines and facing page text to identify the information exchanged on the needline; it also puts the text description of the information exchanged on the lines in the diagrams where ever space was available to make the diagram more useful to the reader. If only the numbers were used, the technical reader would be likely to start writing in the text descriptions of the information exchanges on the lines just to keep it straight in his mind. The text should be added to the diagram where ever possible.

The international trade ONCDs were separated by activity to reduce complexity. This allowed fewer lines on each diagram. The nodes which did not participate in the activity were made a lighter color so they would be less noticeable to the reader. However, it was considered important to preserve all nodes on all diagrams, because 1) the fact that a node does not participate in an activity is information, and 2) consistency of presentation to the reader is increased by keeping all nodes. With the decision to keep all nodes on all diagrams, there was some position adjustment of nodes in each diagram to get a node placement that minimized line crossing while still keeping the relative position of nodes fairly constant across the diagrams. Whether automated tools would help with this task is unknown. Originally, the line numbering in each ONCD diagram was started at 1. To create a set that can be easily integrated, the numbering should be unique across all diagrams and the connection between the same two nodes on different diagrams should be labeled the same. The Promote Trade ONCD and associated IEM show needline numbers 101 and 125; the other ONCDs could be numbered in the 200s, 300s, and 400s, respectively, but needlines appearing in two or more diagrams should be labeled with the same number to facilitate integration.

The grants ONCD contains the names of the activities performed at each node as recommended by the DoD product description. The complexity of the final version of the international trade ONCDs left no space to list the activities, but these lists were a useful crosscheck of information exchanged, activity location, and clarity of thinking when doing the grants model. For the international trade pilot, the information is captured in the IEM (sort on node, then sending or receiving activity). The analyst needs to know the node/activity mapping while building the ONCD (generally built before the IEM), whether he captures the information on the ONCD or not. Putting the names on the ONCD is recommended. If space is inadequate, the analyst may choose to put the information in facing page text. In the DoD Architecture Framework Version 1.0, the activities performed at each node will be required in the node dictionary entry.

3.5 Operational Information Exchange Matrix

The IEM is critical to capturing interoperability, network sizing, and security requirements. Characterizing the size/units, collaborative, and information assurance aspects of the exchange

required some consideration. For example, the size characterization of the information required to complete an application for a grant could be two pages or 100 pages. In today's world, 100 page text documents are normally attached to e-mails and transmitted with no difficulty, so it is treated as bounded and small. What is indeterminate, small, bounded, etc. for an architecture will require some consideration by the architect.

The determination of whether an individual filling out a professional profile form using a web interface to a database that resides on the Federal Commons is collaborative or one way took some discussion. These kinds of characterizations will also require some consideration by the architect.

As has been pointed out elsewhere, the IEM was developed as a spreadsheet to take advantage of its sorting and page formatting capability.

3.6 System Interface Description

The grants SID includes a representation of the Web as a mesh in the background. This, we felt, was an improvement over the cloud often used to represent the Web, but there is still room for creativity in how to portray the Web in these diagrams.

3.7 High-Level Operational Concept Description

A draft High-Level Operational Concept Description (OpsConcept) might be created early in the process for discussion, status, or promotion purposes, but in both these pilots, the cartoon-like diagram was created late in the process, when the activities and organizations involved were fairly well understood. The grants OpsConcept had the problem of a system at the center cited in the discussion of the ONCD. It was kept generic (rather than listing all agencies and all grantees) like the ONCD and is patterned after it.

The international trade OpsConcept built upon a diagram made for Customs, but expanded beyond it to incorporate other agencies. The positioning of icons to minimize or eliminate line crossing, the positioning of ITC, USDA, ITA, SBA, and the EX-IM Bank so they could interact with both the Trade and policy development, and the positioning of icons so they had some logical order from which a story could be told required considerable thought. Showing the flow of goods adds to the sense of trade activities and the ability to explain the business process. The aqua, magenta, and yellow backgrounds to help the observer find some areas of focus were among the last additions to the diagram. The complexity of this diagram reflects the complexity of the model. The diagram became very useful to orient subject matter experts on the trade model. It provides an example of how an architect might represent a complex architecture operational concept.

3.8 Technical Architecture Profile

The Technical Architecture Profile used the DoD Joint Technical Architecture (JTA) Version 2.0 (7) as a source for the state of the practice for standards people are using. The analyst selected

very basic things needed to support Web applications. It provides a starting point for future development.

3.9 Overview and Summary

The Overview and Summary was the last formal product begun for both grants and international trade. The architecture purpose and scope had been developed as part of developing the Activity Model purpose and scope. The context information for grants is somewhat redundant with the information presented later. For international trade, the information is a simplified high level overview to allow the reader to progressively build his understanding and not be overwhelmed with detail. This simplification was possible once the broader picture had been established in the Activity Model.

3.10 Resources Used to Build the Pilot Architectures

Prior to initiation of the pilots, three staff months of management education and planning time was spent to educate the community on the value of an enterprise architecture, the value of a framework, and the value of having product descriptions in the framework, and to plan the pilots and establish tool selection criteria.

The Federal Grants Pilot Architecture used a total of 9.0 staff months over a period of five months. This included about 2.8 staff months from the primary analyst; 6.0 staff months from other analysts providing interview, sounding board, document writing, cross checking, editing, and review support; and about 0.2 staff months of management time. This does not include the time to develop the products in PTECH FrameWork, but does include development of the products using Microsoft Office tools.

The International Trade Pilot Architecture used a total of 7.0 staff months over a period of five months. This included about 3.5 staff months from the primary analyst; 2.7 staff months from other analysts providing interview, modeling expertise, sounding board, and review support; and 0.8 staff months of management time. This also included time to develop the products using Microsoft Office tools, but not the time to prepare this analysis document. The project benefited from the previous experience with the Grants Pilot (the same staff was used) where many product issues had already been addresses.

The international trade pilot, though a more complicated architecture than the grants pilot, required less time because many modeling, document content and organization, and architecture issues had already been addressed in the grants pilot. The grants pilot also used one analyst to develop the models and another analyst to cross check them. The international trade pilot did not use this division of labor. Some of the international trade products are less mature than the grants products.

The development and review of this analysis paper took approximately two weeks of labor over a three-week time span.

Section 4

Comments and Observations on the International Trade Pilot Architecture

Federal international trade responsibilities seek to expand safe, legal, open trade. The federal government protects the safety and security of U.S. citizens while at the same time seeking to increase U.S. exports. International trade is a major business area of the federal government. One source reports 104 federal organizations involved in international trade. International trade has been proposed as a segment within the Federal Enterprise Architecture (FEA). The following discussion examines aspects of international trade as a segment within the FEA.

4.1 Participants

Many agencies have international trade responsibilities. The major participants include the United States Department of Agriculture (USDA) including its Foreign Agricultural Service (FAS), the United States Department of Commerce including its International Trade Administration (ITA), Bureau of Export Administration (BXA), and Bureau of the Census (Census), the Small Business Administration (SBA) and its Office of International Trade (OIT), the International Trade Commission (ITC), the Export-Import Bank (EX-IM Bank), the Department of the Treasury's U.S. Customs Service (Customs), and the United States Trade Representative (USTR). See the Integrated Dictionary ICOM section on organizations for a more extensive list of participants and their responsibilities.

4.2 Common Data Areas

The following table shows major common data items or common forms of information used, or which could be used, by more than one agency supporting international trade. Some of the data items, e.g., Shipper's Export Declaration (SED), have standard formats and definitions. Others do not.

Table 2. Major Common Data Items or Common Forms of Information in the Federal International Trade Pilot Architecture

Data	Produced By	Used By (and Potential Users)	Activities Where Used	Comment
Leads and Contacts	ITA, FAS, SBA, Others	ITA, FAS, SBA, Public, Others	Provide Leads and Contacts	A coordinating committee for trade promotion exists.
Trade Promotion Events Information	ITA, FAS, SBA, Others	ITA, FAS, SBA, Public, Others	Promote U.S. Goods Abroad, Encourage U.S. Companies to Export	A coordinating committee for these activities exists. Information related to these events is posted on a web site.
U.S. Harmonized Tariff Schedule	ITC	ITA, ITC, Customs, Census, USDA, State, USTR, Public, Others	Provide Public Walk-In, Call-In, Web, and Classroom Trade Information, Process Entry Summaries, Process SED (Annotated version), Reconcile and Liquidate Transaction Entries, Provide Harmonized Tariff Schedule, Compile Import and Export Statistics, Evaluate Trends, Impacts, and Trade Practices, Develop Trade Policy	Fixed table updated periodically, available electronically. Web interface available to public.

Data	Produced By	Used By (and Potential Users)	Activities Where Used	Comment
U.S. Trade Statistics	Census FTD, BEA	ITA, ITC, USDA, State, Public, Others	Provide Tailored Market or Company Reports or Statistics, Compile Import and Export Statistics, Evaluate Trends, Impacts, and Trade Practices, Develop Trade Policy	Fixed table updated periodically, available on CD. Each agency tends to develop its own easy-to-use interface and use selected subsets of the data.
Foreign Tariff Schedules	Foreign Governments , WTO - No definitive automated U.S. Source	ITA, ITC, USDA, State, USTR, Public, Others	Provide Foreign Market Information, Evaluate Trends, Impacts, and Trade Practices, Develop Trade Policy	A good quality shared electronic source is not maintained by the U.S. government
Foreign Trade Statistics	Foreign Governments - No definitive automated U.S. Source	ITA, ITC, USDA, State, Public, Others	Provide Foreign Market Information, Evaluate Trends, Impacts, and Trade Practices, Develop Trade Policy	A good quality shared electronic source is not maintained by the U.S. government
Foreign Trade Regulations and Practices	No definitive automated U.S. Source	ITA, USTR, Public, Others	Provide Foreign Market Information, Evaluate Trends, Impacts, and Trade Practices, Develop Trade Policy	No automated source of this information was identified during this analysis

Data	Produced By	Used By (and Potential Users)	Activities Where Used	Comment
Entry Documentation	Importer/Broker and subsequently Customs	Customs Enforcement	Process Entry Documentation (all sub processes), Place Goods In Bonded Warehouse, Conduct Inspections. Prevent and Investigate Illegal Import Shipments and Fraud	Electronic submission mechanism is available to trade community, but is not web based and requires either service agent or sophisticated approved software interface. Once captured accurately, the data is stable. Status information may be added.
Entry Summary	Importer/Broker and subsequently Customs	Customs Census Enforcement	Process Entry Summary, Process Payment Monies, Prevent and Investigate Illegal Import Shipments and Fraud, Compile Import and Export Statistics	Electronic submission mechanism is available to trade community, but is not web based and requires either service agent or sophisticated approved software interface. Once captured accurately, the data is stable
Import or Export Licenses or Permits	Importer or Exporter and subsequently one of many issuing agencies	Customs Enforcement	Manage Import Licenses, Permits, and Certificates of Compliance, Verify Licenses and Permits, Manage Export Licenses, Process SED, Prevent and Investigate Illegal Import Shipments and Fraud, Prevent and Investigate Illegal Export Shipments	An export license management system with web interface exists. No automated mechanisms to communicate license information among agencies exists. Once captured accurately, the data is stable.

Data	Produced By	Used By (and Potential Users)	Activities Where Used	Comment
Shipper's Export Documentation (SED)	Exporter and subsequently Customs or Census	Customs Census Enforcement	Process SED, Perform Risk Assessment, Prevent and Investigate Illegal Export Shipments, Compile Import and Export Statistics	Electronic submission mechanism with web interface is available through Census. Customs has more sophisticated software interface available through service. Once captured accurately, the data is stable.
Arrival or Departure Information	Importer or Exporter and subsequently Customs (Not clear about other agencies)	Customs FSIS APHIS EPA FDA DOT INS	Conduct Inspections	Automated communication of arrival information among agencies was not identified in this analysis. It may exist for Customs in some of the automated manifest or other systems.
Inspection Needs Information	Importer or Exporter	Customs FSIS APHIS EPA FDA DOT INS	Conduct Inspections	Automated communication of inspection needs among agencies was not identified in this analysis
Money Payments	Importer	Customs and subsequently Treasury	Process Payment Monies	An automated system for making payments exists. The adequacy of it was not assessed.

Data	Produced By	Used By (and Potential Users)	Activities Where Used	Comment
Analysis Reports and Memos	ITA, ITC, FAS, ERS, State, Others	ITA, ITC, FAS, State, USTR, Congress, White House, Public, Others	Evaluate Trends, Impacts, and Trade Practices, Develop Trade Policy	Some reports are transmitted electronically. Memos includes e-mails. Each analysis group may be analyzing different subsets of trade statistics or other information and may be using its own processes. The commonality of these processes was not examined in the level of detail in this report. There may be data or process overlap, or, there may be commonality of reporting style.
Policy Recommendations, Policy	ITA, ITC, FAS, State, USTR, Others	USTR, Congress, White House	Develop Trade Policy	Some policy recommendations and associated emails are transmitted electronically. The commonality among recommendations in content topics or style was not examined. Reportedly the processes for developing policy are highly iterative, so the data in an individual recommendation may be stable at the time transmitted, but continually updated over time. The interactive or common manipulation aspects of this activity were not examined.
Negotiation Position Recommendations	ITA, ITC, FAS, State, SBA, Treasury, USTR, Others	USTR, ITA, ITC, FAS, Treasury	Negotiate Trade Agreements (internal)	Some recommendations are transmitted electronically or through e-mail. The style, content of recommendations, and other commonality aspects were not examined for the level of detail in this report.

Note: The Activity Model may not show all of the information uses described above.

Recommendation 4: Based on the observations in Table 2, continue to develop the international trade segment by developing the following areas to improve information sharing and easy access.

- Import and export license information
- Arrival/departure information
- Inspection needs
- U.S. import and export trade statistics – common easy to use interface only
- Foreign tariffs, trade statistics, and business regulations

Entry documentation, entry summary, and Shipper's Export Declaration (SED) information processing are being improved by Customs and Census and are therefore not included in this list. The Customs Modernization effort may also address portions of the first three topics listed, building on the International Trade Data System (ITDS) concepts, but they are specifically cited here to ensure all cross-agency needs are considered. For information areas such as licenses and inspection needs, develop a cross-agency common set of data elements, definitions, and representations if it does not exist.

Investigate the following areas in depth to determine information sharing or common process possibilities.

- Enforcement
- Analysis of trade and tariff information
- Policy development
- Trade agreement negotiation
- Trade leads and contacts

The nature of the information produced (e.g., analysis reports, policy drafts) and style of information sharing (e.g., reports, e-mails) associated with policy development and trade agreement negotiation may require a more textual and interactive rather than traditional table-oriented or computational data processing approach.

4.3 Common Processes

While several agencies may be performing what, at the highest level, is called the same activity, e.g., performing inspections or analyzing trade information, each agency has its own area of responsibility. Each one inspects different goods for different things, or analyzes different data sets than other agencies. The processes are common in that, for example, to conduct inspections, an agency needs to know the shipment requires inspection, know when the shipment will arrive, schedule an inspector, conduct the inspection, approve or reject the goods based on the inspection, and report on the inspection to the government agency and to the importer. These 'common' functions may offer opportunity for shared automation tools to manage the process.

4.4 Modeling Issues

The trade activity model went through several major reorganizations of the activity hierarchy before it stabilized. The issues included the following.

Where should import processes be separated from export processes? Both do licensing, both do inspections, both require forms to be completed. Only import has tariff payment processing.

Where should the court dispute settlement activities be placed? They are normally associated with a transaction, but not always. A case could be brought over practices rather than a specific transaction. Some court activities are associated with criminal prosecutions. Eventually they were placed with the infrastructure, but this may not be optimal when more is known. These activities may have a stronger tie to potential criminal justice segment processes.

There are many kinds of enforcement activities. They could involve company procedural compliance, criminal investigation, smuggling or licensing violations, import anti-dumping and counter-veiling duty issues, or foreign trade agreement monitoring. The trade agreement enforcement was placed with the treaty negotiation because often the same players are involved in the resolution of a trade agreement violation and in trade agreement negotiation; the two are strongly related. Based on feedback from reviewers which is not incorporated into the model at this time, the separation and organization of the enforcement and compliance activities need additional analysis.

4.5 To-Be Model

Due to resource constraints, no formal to-be model was developed for international trade. There was some experimentation early on with a to-be ONCD. Paralleling the grants objective of creating a common face of government for the grants community, one could look at the international trade ONCD, see the fan-like connections from the Trade community importers, exporter, brokers, carriers, etc. to government agencies and immediately think of the common face of government model. This concept seems to have originated in government strategies of the early and mid 1990s and was documented in early International Trade Data Systems (ITDS) literature. This concept still warrants exploration as part of the licensing, inspection, and other topics covered in Recommendation 4.

4.6 Summary

The Federal International Trade Pilot Architecture provides a broad overview of federal international trade processes, the relationships among those processes, the data used, and the relationships among the federal agencies involved. Though it needs better enforcement modeling and some of the products are relatively immature, it is a good, balanced starting point for more detailed analysis of the elements of an international trade segment for the Federal Enterprise Architecture. Future work should investigate, among

other things, the detail of the information exchanges to establish interoperability requirements. The license, permit, and certification area would be a good cross-agency area to develop to meet safety protection needs and work out cross agency-procedures. The enforcement area would strengthen security and safety aspects of international trade and may be related to the Criminal Justice Segment of the Federal Enterprise Architecture.

Section 5

Comments and Observations on the Federal Grants Pilot Architecture

The Federal Grants Pilot Architecture focused on the Federal Commons to limit the scope of the project. Federal Commons was a project in work at the time the pilot was begun. The Federal Commons project had made major progress on standardizing the data elements on a grants application. The implementers of the Federal Commons served as the subject matter experts for the pilot architecture.

The Federal Commons deals with federal agencies sending and receiving information to/from applicants and grantees. It does not deal with the operations that go on within federal agencies to manage grants. The Federal Commons is a system rather than an enterprise; the pilot put a business context around it to give it more of an enterprise architecture flavor. As a small, contained topic, the Federal Commons served well as a relatively simple example to demonstrate the use of DoD products and examine issues related to building those products. The effort proposed solutions for capabilities that had not been addressed at the time of the pilot analysis as indicated in the footnotes of the Federal Grants Pilot Architecture document. However, examining the Federal Commons does not provide enough information to analyze the proposed grants segment.

Recommendation 5: To continue laying the groundwork for the proposed grants segment, examine the grants management business processes within federal agencies and the associated data and its flow. This examination should cover federal agencies and grantees with different quantities of grants to manage, different types of grants, and different sophistication in their grant processes. For example, the National Institutes of Health has a very sophisticated grant community and makes large grants. The Department of Education may make smaller grants, but makes thousands of them. Other federal agencies may not have advanced automated systems to deal with managing grants. The needs of all of these situations should be examined as well as cross-agency grant-related communications. The analysis should look for common processes that might allow common automation tools and improve the consistency of the interface with the public while preserving the decision-making authority and control of the agency.

Section 6

Commonality between Grants and International Trade

The commonality between grants and international trade appears to be limited based on the pilots. Federal agencies in the international trade community make grants and would be users of the Federal Commons. Other than grant-related items, they do not appear to share common data or common business processes.

Grants and international trade may be able to share the same style of interface mechanism. The Federal Commons approach may be applicable to license applications and for arrival information and inspection needs. License applications come from the trade community and could be routed to the appropriate federal agenc(ies) with notifications approving the license going to the requestor and to Customs. Inspection needs likewise could be submitted from the Trade and routed to the appropriate federal agenc(ies). Arrival information is needed not only by Customs but by other inspecting agencies and needs to be routed to other agencies

References

1. DoD Working Group, C4ISR Architecture Framework, Version 2.0, 18 December 1997, to be replaced by DoD Architecture Framework Version 1.0, to be published Fall 2001.
2. Chief Information Officers (CIO) Council, Federal Enterprise Architecture Framework Version 1.1, September 1999.
3. MITRE Corporation, Federal Grants Pilot Architecture, 27 February 2001, updated September 28, 2001.
4. MITRE Corporation, Federal International Trade Pilot Architecture, September 28, 2001.
5. Office of Management and Budget Circular No. A-130, November 20, 2000, www.whitehouse.gov/omb/circulars/a130/a130trans4.html.
6. Institute of Electrical and Electronic Engineers, Inc., IEEE Standard for Functional Modeling Language – Syntax and Semantics for IDEF0, IEEE Std 1320.1-1998, 1998.
7. Department of Defense Joint Technical Architecture Version 2.0, 26 May 1998.